



A STUDY OF THE IMPACT OF CHEMICAL INDUSTRIES EFFLUENT IN RIVER CAUVERY AT METTUR DAM IN SALEM DISTRICT

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Abstract

The investigator has taken an attempt to study the impact chemical industries located in and around the chemical industries at Mettur Dam area on the banks of the Cauvery River. River water and Well water samples were used for various domestic purposes. Residents are living in the Cauvery river bank and the ground water on the banks of the river is and highly polluted. Now the Cauvery River is mainly used for discharge of highly polluted industrial effluents from Chemicals industries in and around Mettur Dam the ground water affected due to percolation of the Cauvery river water. Due to urbanization very high volume of sewage water let in to the Cauvery River and the discharge of Industrial effluents increase the pollution load in the Cauvery River. It is observed from the present study that the river is naturally favorable for discharge of chemical industry effluent water during rainy seasons. Water quality analysis of Bore well and well water collected from the Cauvery river bank reveals that the water cannot be used for domestic and also for drinking purpose. As per the health centre and hospital data people living in the study area suffers from the water bone diseases like, Diarrhea, dysentery, and even cholera. Once an aquifer is polluted by percolation of the contaminated water it is very difficult for reclamation. The TDS hardness, high contents of chloride causes the water to be saline. It was also observed in many cases that heavy contamination of sewage leads to complete pollution of the ground water on the banks of the river Cauvery. It is observed that neither the river water and the Ground Water is Unsuitable for domestic use. Very significant results are seen in the case of nitrites, nitrates and phosphates. Both in the river and in the groundwater their presence are above limits by standards as per CPHEEO standards. But the possibility of their contributing to diseases like blue baby syndrome and stomach cancer are to be seriously considered.

Keywords: Cauvery Rive; Industries Effluent; CPHEEO standards.

INTRODUCTION

Water is an ordinary substance with extra ordinary qualities. It is the most common material handled by every man, every day, everywhere. It is of

vital importance for the support and essential of life not only of man but of all life on earth. (Salomoni, SE. and Torgan, LC., 2008. Epilithic diatoms as organic contamination degree indicators in Guabia Lake, southern Brazil. ActaLimnologicaBrasiliensia, vol. 20,

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no. 3, p. 313-324). Water pollution is defined as the addition to water of an excess material or heat that is harmful to the living organisms or which impairs the beneficial uses of water. Pollution makes water physically impure, foul or filthy. (American Public Health Association, Standard methods for the examination of water and wastewater, 20th edition, 1998, Washington DC, USA). It changes the natural qualities of water, so that it becomes unsuitable for the uses to which it is normally put to. Pollutants may be present in water either as suspended particles or as dissolved compounds or both. The dissolved compounds are more difficult to remove and hence these taint the water resources more seriously than the suspended impurities. High population densities and multiplicity of industrial and agricultural activities expose most hydrographic basins to heavy and rising environmental impacts especially to pollution by domestic and industrial waste residues. (Johnson, C.H.; Devall, S. (1997): "Treatment of Slaughter House and Chemical Plant Wastewater in Moving Bed Biofilm Reactors". Proceedings, WEF Specialty Conference Series – Industrial Wastes Technical Conference, New Orleans, LA, USA, March 3-5). (Johnson, C.H.; Page, M.W., Cruze, J.A. (1998): "Treatment of Phillips 66 – Borger Refinery Wastewater in Moving Bed Biofilm Reactors". Proceedings, WEFTEC'98, Orlando, Florida, USA, Oct. 4-7).

The sensitivity of diatom communities has led them to be used as indicators of environmental conditions, such as water quality and habitat conditions in river systems and stream (Soininen et al., 2004). Venkatachalapathy & Karthikeyan (2012, 2013) has recorded a total of 60 diatoms belonging to 21 genera from Cauvery river in parts of Tamil Nadu. Among these *Achnanthes minutissima* Kutz, *Achnanthes minutissima* Plonensis, *Achnanthes minutissima* Aulacoseira distans, *Cymbella turgida* (Greg) Cleve, *Cymbella ventricosa* Kutz, *Fragilaria intermedia* Grun var. *robusta*, *Gomphonema lanceolatum* Ehr, *Nitzschia sigma* (Kutz) Venkatachalapathy and Karthikeyan W Smith, *Synedra rumpfen*, *Synedra ulna* (Nitzsch) Ehr were the most abundance species.

With this object in view, a study of physico-chemical quality of surface and ground water in Mettur Dam city was undertaken, the area chosen is a place in and around Mettur Dam through which flows the river Cauvery, a river of ancient glory. (Ødegaard H., Rusten B. and Westrum T. (1994). "A new moving bed biofilm reactor – Applications and results". Wat. Sci. Tech., 29 (10-11), 157-165). One of the very interesting features of Cauvery river and mettur dam is that the ancient rulers of the country, the cholas had

arranged for collecting the waters from the river by means of canals in a great number of tanks large and small for providing water for domestic as well as irrigation purposes and as catchment areas for rain water throughout the year. As with many other rivers Cauvery also has been polluted by industrial effluents domestic, irrigational and industrial sewages. (Ekenberg, M, Welander, T (2004): "Biological treatment of wastewater from SASOL in moving bed biofilm reactors", Internal Pilot Study Report). (E. Nauman, Overview and Economic Review of the South African Metal Finishing Industry, University of Cape Town, South Africa (2000).

Most people have to depend on groundwater extracted through bore wells in their houses. The water table which was about 40 ft ten years ago has come down to 150 ft now and in some places it is nearing 400 feet. (ATSDR, Toxicological Profile for Cyanide, Department of Health and Human Services, Atlanta, USA (1995). It is in this situation that this investigation is undertaken to analyse the available water quality in a chosen area adjoining the banks of the river. Cauvery Physical and chemical parameters have been studied to determine the quality and fitness for human consumption.

2. SCOPE AND OBJECTIVES

Most of the chemical industries located in and around. The number of Chemical, Industries Located around Mettur Dam discharge effluent from the Laboratories and industries, located around the Cauvery River at Mettur Dam. The other canals also discharge the polluted effluent in to the river without any treatment is increasing day by day. The absence of treatment plant to treat the industrial effluent and sewage water may lead to spoilage of the Cauvery River. One fine morning people will not be able to get good quality of drinking water from the ground water around the Cauvery River Bed.

The environmental damage caused by water pollution by the discharge of chemical waste water and industrial effluent in Cauvery River has not been so far studied.

2.1. OBJECTIVES

To study the Physico - Chemical parameters of the River water in and around Mettur Dam Area. To study the Physico - Chemical parameters of the ground water present in the wells and bore well on the banks of the river, Cauvery at Mettur Dam. To recommend suitable remedial measures for the treatment of polluted ground water using Reverse osmosis.

3. MATERIALS AND METHODS

The river Cauvery passes through the Mettur Dam from west to east, dividing the city between north and south being connected through several bridges and causeways. It was decided to collect water sample the river for a stretch of about kilometers length along the northern and southern banks for collecting water samples from the running river and the ground water. The Cauvery river starts at Kudagu hills at Karnataka and flows through K.R.Sagar, Okagnakal, Palaru, Mettur, Bhavani, Pallipalayam, Jadaripalayam, Kodumudi, Mohanur, Kulithalai, Trichy, Thanjavur and Karaikal. Finally it reaches Bay of Bengal.

Apart from what the river carries from the west as upstream, large channels some of them three meters broad discharge their untreated Industrial waste water municipal sewage into the river in this area also. River water samples were collected at different places along the route.

Ground water samples were collected from bore wells found about 400 to 500 metres away from the river bank on both sides. Six different places, three on each side of the river were spotted out for these samples.

For sample collection, the methods recommended by Tamil nadu Water Supply and Drainage Board has been adopted. The samples were collected in clean two litre polyethylene PET bottles. Before collection of the sample, the container is washed with the water to be sampled for two or three times. The water is then taken in full completely in the container without leaving any air space. The inner cap is placed. Then a piece of polythene sheet is placed between the inner and outer caps. The outer cap is screwed. Another polythene sheet is placed over the outer cap and the neck tied with a twine thread. The container is labeled with source particulars. Before filling the container the recommended preservation techniques were followed wherever necessary.

These samples collected for physical and chemical examination were taken to the laboratory within 6 hours from the time of collection. Sample holding times were kept to the possible minimum.

The laboratory methods for the determination of physical and chemical parameters were more or less the same as adopted by the Tamilnadu Water Supply and Drainage Board with suitable modification depending on the availability of reagents and instruments.

Surface and ground Water quality characterization of the selected samples, are to be done by choosing parameters that are normally recommended as per well known Indian and International standards. For the purpose of this investigation of physical parameters and chemical parameters have been chosen for study. The methods adopted for these parameters are given in the forthcoming pages.

Table 1. Details of Physico-chemical Characteristics Studies

S.NO	Parameter	Method of Analysis
1	Colour	Visual comparison
2	Turbidity	Neplo turbidity meter
3	TDS	Conductivity method
4	Electrical conductivity	Conductivity meter
5	pH	pH Meter
6	Total hardness	EDTA Titrimetric method
7	Calcium	EDTA Titrimetric method
8	Magnesium	Calculation from Total Hardness
9	Iron	Spectrophotometer
10	Ammonia	Nessler's Method
11	Nitrite	Spectrophotometer
12	Nitrate	Spectrophotometer
13	Chloride	Silver nitrate
14	Fluoride	Colorimetric meter
15	Sulphate	Turbidity method
16	Phosphate	Spectrophotometer

4. RESULTS AND DISCUSSION

Surface and ground Water quality analysis were under taken from samples of water from Cauvery River. It is therefore essential now to examine the results and to interpret the findings. The purpose is to see how far these samples measure upto the standards expected to fulfill the needs of a safe drinking water for the population depending on them. There are standards set by various national bodies like the

U.S.P.H. (United States Public Health Standards) and B.I.S (Bureau of Indian Standards) and also international bodies like the WHO (World Health Organization) and CPHEEO – (Central public health Environmental Engineer organisation. Various physico-chemical parameters analysed using standard methods for water and wastewater analysis (APHA, 1998).

Table 2. Comparison of Chemical Parameters in Different Water Samples

S.No	Parameters	Standard A	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
1.	pH Value	6.5	7.95	7.6	7.9	7.4	7.4	7.5	7.71	7.3	7.63	7.64
2.	Total Hardness as CaCO ₃	200	240	300	280	420	220	350	200	390	290	300
3.	Calcium as Ca	75	40	60	64	72	55	80	48	84	69	70
4.	Magnesium as Mg	30	24	22	5	34	22	36	20	96	39	42
5.	Iron as Fe	0.1	1.32	0.35	1.06	0.86	6.34	0.6	1.12	0.2	0.8	0.9
6.	Free Ammonia	-	1.67	0.32	1.1	0.64	1.44	0.8	1.42	1.12	3.6	3.8
7.	Nitrite as NO ₂	-	0.59	0.3	0.2	0.04	0.14	0.2	0.2	3.12	0.4	0.6
8.	Nitrate as NO ₃	45	0.3	3	4	4	2	2	5	3	3	5
9.	Chloride as Cl	200	165	150	100	255	1.17	325	130	6	7.5	7.6
10.	Fluoride as F	0.1	0.8	0.6	14.2	0.6	0.4	0.5	0.5	0.8	0.9	0.8
11.	Sulphate as SO ₄	200	137	54	31	40	24	51	39	111	3.2	32
12.	Phosphate as PO ₄	-	0.67	0.17	0.58	0.59	0.3	0.51	0.20	0.8	0.2	0.20
13.	TDS Test	Nil	0.52	0.57	0.64	0.5	0.36	0.3	0.36	0.36	0.32	0.51
14.	BOD	-	5.2	5.7	6.4	5	3.6	3.2	3.6	7.6	3.2	0.6

5.CONCLUSION

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